PRACTICE EXAM 34: ALEKS PPL SIMULATION — FINAL EXAM

1. A painter charges $45 per hour plus a $60 setup fee. If the total bill is $330, how many hours did the painter work?

A. 5 hours

B. 7 hours

C. 6 hours

D. 8 hours

2. Simplify: $(3x - 2)^2 + (3x + 2)^2$.

A. $9x^2 + 8$

B. $18x^2 + 8$

C. $18x^2 - 8$

D. $18x^2 + 16$

3. Solve: $2x^2 - x - 3 = 0$.

A. $x = 1$ or $x = -3/2$

B. $x = 3/2$ or $x = 1$

C. $x = -1$ or $x = 3/2$

D. $x = 3/2$ or $x = -1$

4. A rectangle has length twice its width. If the perimeter is 36, what is the area?

A. 72

B. 54

C. 48

D. 96

5. Simplify: $x^{(1/2)} \cdot x^{(3/2)}$.

A. $x^{(3/4)}$

B. $x^{(1/3)}$

C. x^2

D. $x^{(2/3)}$

6. What is the exact value of $\sin(45°) \times \cos(45°)$?

A. 1

B. $\sqrt{2}/2$

C. $\sqrt{2}$

D. 1/2

7. Solve: $\log_2(x) + \log_2(3) = 3$.

A. $x = 3/8$

B. $x = 8/3$

C. $x = 6$

D. $x = 24$

8. A right triangle has hypotenuse 13 and one leg 5. What is the other leg?

A. 12

B. 10

C. 8

D. 14

9. Factor completely: $2x^3 - 18x$.

A. $2(x - 3)(x + 3)$

B. $2x(x^2 - 9)$

C. $(2x - 6)(x + 3)$

D. $2x(x - 3)(x + 3)$

10. If $f(x) = x^3$ and $g(x) = x + 2$, what is $(f \circ g)(1)$?

A. 9

B. 3

C. 27

D. 5

11. A cone has radius 5 and slant height 13. What is the height?

A. 12

B. 8

C. 10

D. 18

12. Solve: $(x - 2)/3 + (x + 1)/2 = 3$.

A. $x = 2$

B. $x = 3$

C. $x = 1$

D. $x = 19/5$

13. A bag has 5 red, 3 blue, and 4 green marbles. What is the probability of drawing a blue marble?

A. 1/3

B. 1/4

C. 3/4

D. 1/12

14. Simplify: $(x + 3)^2 - 9$.

A. $x^2 - 9$

B. $x^2 + 9$

C. $x(x + 6)$

D. $x^2 + 6x - 9$

15. What is the slope of a line parallel to $y = 3x - 2$?

A. 3

B. -3

C. 1/3

D. $-1/3$

16. A cube has volume 125 cm^3. What is the surface area?

A. 25 cm^2

B. 100 cm^2

C. 125 cm^2

D. 150 cm^2

17. Simplify: $(x^2 + 3x)/(x^2 - 9)$, assuming $x \neq \pm 3$.

A. $x + 3$

B. $x/(x - 3)$

C. $1/(x + 3)$

D. $x(x + 3)/(x - 3)$

18. Solve: $x^2 + 8x + 15 = 0$.

A. $x = -5$ or $x = 3$

B. $x = 5$ or $x = -3$

C. $x = -5$ or $x = -3$

D. $x = 15$ or $x = 1$

19. If $\log(x) = 2$, what is x?

A. 100

B. 20

C. 10

D. 0.01

20. A line passes through $(-1, 2)$ with slope 3. What is the equation in slope-intercept form?

A. $y = 3x - 5$

B. $y = 3x - 1$

C. $y = 3x + 1$

D. $y = 3x + 5$

21. What is the domain of $f(x) = \sqrt{(x + 7)}$?

A. $x \leq -7$

B. $x > -7$

C. $x \geq 7$

D. $x \geq -7$

22. Simplify: $(3 + \sqrt{5})(3 - \sqrt{5})$.

A. 4

B. 9

C. $\sqrt{5}$

D. 14

23. A line has x-intercept 5 and y-intercept 2. What is the slope?

A. 5/2

B. 2/5

C. −2/5

D. −5/2

24. A regular pentagon has perimeter 45 cm. What is each side length?

A. 5 cm

B. 9 cm

C. 10 cm

D. 15 cm

25. Simplify: $\cos(-\theta)$.

A. $\sin \theta$

B. $-\cos \theta$

C. $-\sin \theta$

D. $\cos \theta$

26. A car travels 320 miles on 10 gallons of gas. How many miles per gallon?

A. 32 mpg

B. 30 mpg

C. 28 mpg

D. 16 mpg

27. Simplify: $(2x^3)(3x^2)$.

A. $5x^6$

B. $6x^6$

C. $6x^5$

D. $5x^5$

28. Solve the system: $2x + y = 8$ and $x - y = 1$.

A. (1, 6)

B. (4, 0)

C. (2, 1)

D. (3, 2)

29. What is the area of a triangle with vertices (0,0), (4,0), (0,3)?

A. 7

B. 6

C. 12

D. 24

30. Convert $\pi/4$ radians to degrees.

A. 45°

B. 60°

C. 90°

D. 30°

PRACTICE EXAM 34: ANSWER KEY AND EXPLANATIONS

1. C — 6 hours, obtained by setting up a linear cost equation. $45h + 60 = 330 \rightarrow 45h = 270 \rightarrow h = 6$. Cost problems with fixed plus variable charges always take this form: rate times quantity plus fixed fee equals total. Always subtract the fixed portion first to isolate the variable cost.

2. B — $18x^2 + 8$, obtained by expanding each square and combining like terms. $(3x - 2)^2 = 9x^2 - 12x + 4$; $(3x + 2)^2 = 9x^2 + 12x + 4$. Add: $18x^2 + 0x + 8 = 18x^2 + 8$. The middle cross terms $\pm 12x$ cancel when the two squares are added, leaving only the even-powered terms.

3. D — $x = 3/2$ or $x = -1$, found by factoring the quadratic. Factor: $(2x - 3)(x + 1) = 0$. Solutions: $2x - 3 = 0$ gives $x = 3/2$; $x + 1 = 0$ gives $x = -1$. The AC method locates the correct split of the middle term, enabling factoring by grouping.

4. A — 72, calculated by finding the dimensions and then the area. Let w = width; length = 2w. Perimeter: $2w + 4w = 6w = 36 \rightarrow w = 6$, length = 12. Area = $12 \times 6 = 72$ square units. Always use the perimeter to derive dimensions before computing area.

5. C — x^2, obtained by adding the fractional exponents. $x^{(1/2 + 3/2)} = x^{(4/2)} = x^2$. Fractional exponents follow the same rules as integer exponents — the product rule applies identically when the bases match.

6. D — 1/2, calculated by multiplying the two memorized unit-circle values. $\sin(45°) = \sqrt{2}/2$; $\cos(45°) = \sqrt{2}/2$. Product: $(\sqrt{2}/2)(\sqrt{2}/2) = 2/4 = 1/2$. Alternatively, this equals $(1/2)\sin(90°)$ by the double-angle identity — both methods yield 1/2.

7. B — $x = 8/3$, obtained by applying the product law of logarithms and converting to exponential form. $\log_2(3x) = 3 \rightarrow 3x = 2^3 = 8 \rightarrow x = 8/3$. Always condense logarithms to a single expression before converting to exponential form.

8. A — 12, calculated using the Pythagorean theorem. Other leg = $\sqrt{(13^2 - 5^2)} = \sqrt{(169 - 25)} = \sqrt{144} = 12$. The (5, 12, 13) Pythagorean triple is one of the most frequently tested combinations — recognize it for instant computation.

9. D — $2x(x - 3)(x + 3)$, obtained by factoring out the GCF first and then applying the difference of squares pattern. $2x^3 - 18x = 2x(x^2 - 9) = 2x(x - 3)(x + 3)$. Always extract the GCF before applying special factoring patterns to achieve complete factoring.

10. C — 27, found by evaluating the inner function first. $g(1) = 1 + 2 = 3$. Then $f(3) = 3^3 = 27$. Composition applies the inside function first; the output becomes the new input.

11. A — 12, calculated using the Pythagorean theorem with slant height, radius, and height. $\ell^2 = r^2 + h^2 \rightarrow 169 = 25 + h^2 \rightarrow h^2 = 144 \rightarrow h = 12$. The (5, 12, 13) triple reappears here, confirming the height quickly.

12. D — x = 19/5, obtained by clearing fractions and solving the linear equation. Multiply both sides by 6: $2(x - 2) + 3(x + 1) = 18 \rightarrow 2x - 4 + 3x + 3 = 18 \rightarrow 5x - 1 = 18 \rightarrow 5x = 19 \rightarrow x = 19/5$. Always clear fractions by multiplying by the LCD before expanding.

13. B — 1/4, calculated by dividing favorable outcomes by total outcomes. Blue marbles: 3. Total marbles: 5 + 3 + 4 = 12. Probability = 3/12 = 1/4. Always reduce probability fractions to simplest form.

14. C — x(x + 6), obtained by expanding the square, subtracting 9, and factoring. $(x + 3)^2 = x^2 + 6x + 9$. Subtract 9: $x^2 + 6x$. Factor out x: x(x + 6). The constant terms cancel, leaving a simple GCF factoring.

15. A — 3, because parallel lines share the same slope. The slope of $y = 3x - 2$ is 3, so any parallel line has slope 3. The y-intercept does not affect parallelism — only the slope matters.

16. D — 150 cm^2, calculated by finding the side length first and then applying the surface area formula. $s = \sqrt[3]{125} = 5$ cm. $SA = 6s^2 = 6(25) = 150$ cm^2. Always derive the side length from volume before computing surface area.

17. B — x/(x − 3), obtained by factoring numerator and denominator and canceling common factors. Numerator: $x^2 + 3x = x(x + 3)$. Denominator: $x^2 - 9 = (x + 3)(x - 3)$. Cancel (x + 3): result is x/(x − 3). Always factor completely before canceling.

18. C — x = −5 or x = −3, obtained by factoring the quadratic. Factor: $(x + 5)(x + 3) = 0$. Both factors equal zero when negated. Solutions: x = −5 or x = −3. Both are negative because the middle coefficient is positive and the constant is positive.

19. A — 100, obtained by converting to exponential form. log(x) = 2 means $x = 10^2 = 100$ (since common log is base 10). A logarithm is always an exponent — the value that makes the base equal the argument.

20. D — y = 3x + 5, derived using point-slope form. $y - 2 = 3(x - (-1)) = 3(x + 1)$. Distribute: $y - 2 = 3x + 3$. Add 2: $y = 3x + 5$. Always watch the sign flip when the x-coordinate is negative.

21. D — $x \geq -7$, determined by the requirement that the radicand be non-negative. $x + 7 \geq 0 \rightarrow x \geq -7$. Domain restrictions for even radicals always come from ensuring the radicand stays zero or positive.

22. A — 4, obtained by applying the difference of squares pattern with conjugate pairs. $(3 + \sqrt{5})(3 - \sqrt{5}) = 3^2 - (\sqrt{5})^2 = 9 - 5 = 4$. Conjugate radicals always produce rational results because squaring eliminates the radical.

23. C — $-2/5$, calculated using the slope formula with the two intercepts. slope = $(0 - 2)/(5 - 0) = -2/5$. Lines with positive x-intercept and positive y-intercept always have negative slope. Always apply the slope formula to intercepts in the form (5, 0) and (0, 2).

24. B — 9 cm, calculated by dividing the perimeter by the number of sides. Regular pentagon has 5 equal sides: 45/5 = 9 cm. Any regular polygon has equal side lengths, so dividing perimeter by side count gives each side.

25. D — $\cos \theta$, because cosine is an even function, meaning $\cos(-\theta) = \cos \theta$ for any angle. This reflects the symmetry of the cosine graph about the y-axis. Sine, in contrast, is an odd function: $\sin(-\theta) = -\sin \theta$.

26. A — 32 mpg, calculated by dividing total miles by total gallons. 320/10 = 32 miles per gallon. Rate problems always divide the larger unit by the smaller unit to express the rate in per-unit terms.

27. C — $6x^5$, obtained by multiplying coefficients and adding exponents with the same base. (2)(3) = 6; x^(3+2) = x^5. Combined: $6x^5$. Always apply the product rule separately to coefficients and variables.

28. D — (3, 2), obtained by adding the two equations to eliminate y. $(2x + y) + (x - y) = 8 + 1 \rightarrow 3x = 9 \rightarrow x = 3$. Then $y = x - 1 = 2$. Always add equations with opposite-signed coefficients to eliminate variables cleanly.

29. B — 6, calculated using the triangle area formula (1/2)(base)(height). The base is the horizontal segment from (0, 0) to (4, 0) of length 4, and the height is the vertical segment from (0, 0) to (0, 3) of length 3. Area = (1/2)(4)(3) = 6 square units.

30. A — 45°, calculated by multiplying radians by $180/\pi$. $(\pi/4)(180/\pi) = 180/4 = 45°$. The π cancels cleanly. Memorize common radian-degree conversions such as $\pi/4 = 45°$, $\pi/3 = 60°$, and $\pi/6 = 30°$.